



**Aquamax TAN**

**USER  
MANUAL**

# GUARANTEE

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The **Aquamax TAN** titrators are guaranteed against any manufacturing defect or component failure.

GRScientific will repair or replace, free of charge, any defective component or parts of the instruments under guarantee.

This guarantee does not cover damage caused by accident, improper use or internal handling by unauthorised persons.

Syringe and valve will be replaced under guarantee once our after sales service confirms they have a factory defect.

This guarantee does not cover defects caused by:

- incorrect use,
- damage caused by accidents,
- premature wear caused by certain working conditions.

Electrodes are also guaranteed against manufacturing defects.

GRScientific will replace any sensor deemed to have factory defects free of charge, once confirmed by our After Sales Service.

This guarantee does not cover defects caused by:

- incorrect use,
- normal sensor wear,
- logical premature wear caused by certain samples,
- damage caused by accidents.

## Validity

Instrument: 5 years.

Sensors: 6 months

## In the event of failure

Contact your local GRScientific dealer.

The continuous improvement of our instruments can bring about differences between the information written in this manual and the purchased instrument.

The data, figures and descriptions contained in this manual cannot be legally asserted.

GRScientific reserves the right to make changes and corrections without prior notice.

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# DECLARATION OF CONFORMITY CE



## Declaration of conformity

**We**

**GRScientific**

P.O. BOX 242, Ampthill, Bedfordshire

MK45 5AQ. UK

declare under our sole responsibility that the product,

**Description**

**Aquamax TAN**

to which this declaration relates is in conformity with the following normative documents:

**Low-voltage directive**

**2006/95/CE**

Standard

UNE-EN 61010-1

07-2002

UNE-EN 61010-1

11-2003

**EMC Directive**

**2004/108/CE**

Standard

UNE-EN 61326-1

10-2006

**Place and date**

**Ampthill, 19.10.2009**

GRScientific

**GRScientific**

## SAFETY MEASURES

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### Warning

Please, read carefully this information before installing and using the instrument.

These safety measures do not purport to address all safety problems associated with the use of this instrument.

It is the responsibility of whoever uses this instrument to consult and establish appropriate health and safety practices and determine the applicability of regulatory limitations prior to use.

1. Never work in an environment subject to explosion hazards. The housing of the instrument is not gas tight.
2. Using chemicals, comply with the general instructions for hazard prevention and safety rules, e.g. wear protective clothing, eye protection and gloves.

3. Read carefully the manual of the instrument.
4. In case of liquids splashes, wipe off immediately. The instrument is not waterproof.
5. Exclude the following environmental influences:
  - vibrations
  - direct sunlight
  - atmospheric humidity higher than 80 %
  - corrosive gases present
  - temperature below 15 °C and above 40 °C
  - powerful electric and magnetic fields.
6. Only use original accessories and spare parts.
7. Have the instrument serviced only by GRScientific Service.

## PRESENTATION

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The Aquamax TAN is specific titrator for Total Acid Number determination in accordance with ASTM D 664.

The messages on the instrument's display guide the user making it suitable for routine analysis.

There are three titrations programs and the user should select one of them for performing the analysis in accordance with the expected TAN value in the sample.

The Aquamax TAN express the result in mg KOH / g sample.

### Supplied accessories

#### Aquamax TAN

- 1 x Plug in power supply 90-264 VAC, 47-63 Hz, 24 Volt DC, code 91 87 36.
- 1 x TLL SL syringe, 10 ml, code 91 92 29.
- 1 x Burette inlet tube with bottle cap DIN 45 screw, code 91 87 05.
- 1 x Burette outlet tube with antidiffuser device, code 91 87 38 .
- 1 x Cotton filter cartridges, code 91 91 99.
- 1 x Support for electrodes and tube with magnetic stirrer, code 91 93 22.

- 1 x Indicator glass electrode, code 91 52 51.
- 1 x Reference electrode, code 91 52 41.
- 2 x Electrode cable with BNC connector, code 92 90 55.
- 2 x Conical adaptor NS 14/23, code 92 87 60.
- 1 x Electrolyte for reference electrode LiCl 1 M in ethanol, bottle of 250 ml, code 91 95 20.
- 1 x Calibration flask of 50 ml for buffer pH 11, stirring bar included, code 91 93 24.
- 1 x Set of 3 titration vessels, 200 ml, code 91 93 23.
- 1 x Pack of white O-rings (10 units) for valve screws, code 91 87 34.

### Optional accessories

- Thermal printer, code 91 82 01.
- Dotmatrix printer, code 91 82 00
- Standard PC keyboard, code 91 90 13.
- Communication software TiCom, code 91 86 82.

## REQUIRED REAGENTS

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Titration reagent: KOH 0.1 mol/l in 2-propanol.

**Warning:** KOH causes severe burns, 2-propanol is flammable.

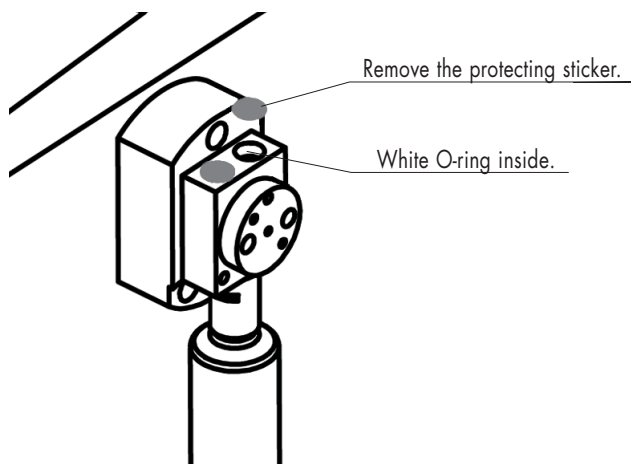
Titration Solvent: Mixture of water / 2-propanol / toluene (in relation 5 / 495 / 500).

**Warning:** Flammable

Aqueous pH 11 Buffer solution

LiCl 1 M in ethanol, electrolyte for refilling the reference electrode

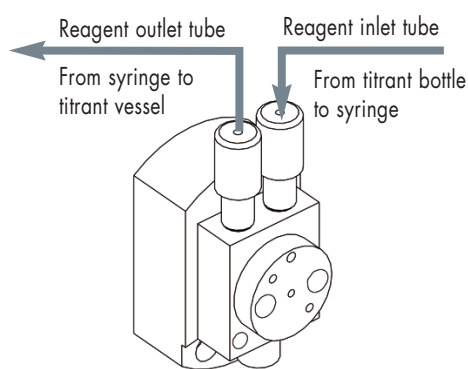
# INSTALLATION



1. Remove the protecting stickers from the inlet and outlet of the valve.
2. Check that there is a small white O-ring in every screw. It must be in horizontal position. This O-ring ensures the union tightness.

**⚠ Attention:** If the O-ring is not inside, check that it is not stuck on the protecting sticker.

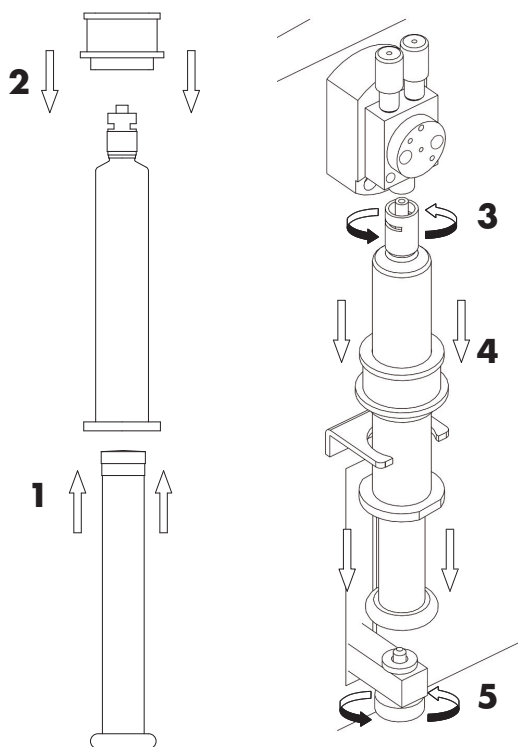
## ... of the burette tubes



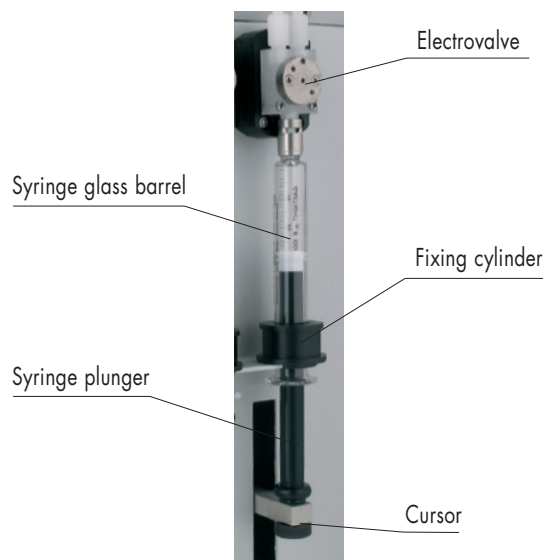
1. Screw the reagent outlet tube on the position placed on the left side of the valve. Place the tube on the sensor support.
2. Screw the reagent inlet tube on the position placed on the right side of the valve. Introduce the tube into the reagent bottle and screw the cap.

**👉 Important:** In order to avoid possible reagent leakage, it is strongly advisable to periodically check and re-tighten the screw joints, especially during the first days of use of the Aquamax TAN.

## ... of the syringe



1. Introduce 1/3 part of the plunger in the glass barrel.
2. Put the fixing cylinder as shown. Switch on the instrument. The cursor automatically goes to down position.
3. Screw the syringe on the valve.




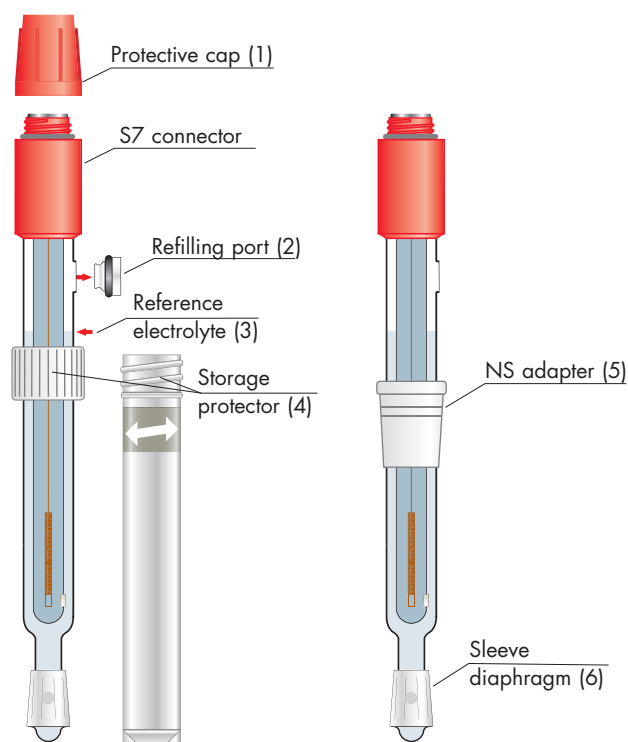
4. Place the fixing cylinder on the metal clamp.
5. Pull the plunger if required and screw it on the cursor.

**👉 Important:** In order to avoid possible reagent leakage, it is strongly advisable to periodically check and re-tighten the syringe in the valve, especially during the first days of use of the Aquamax TAN.

# INSTALLATION

## ... preparation of the electrodes for use

 **Important:** Electrodes are made from glass. Handle them carefully at all time.

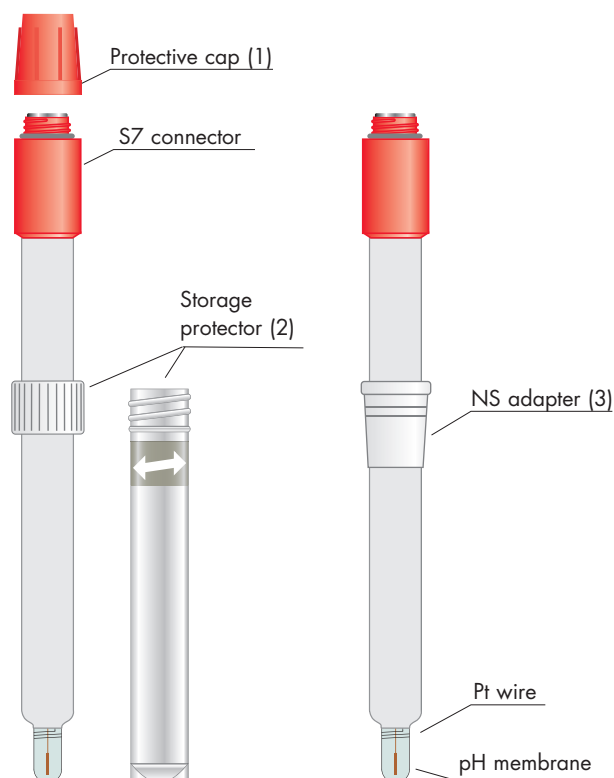


### Reference electrode

1. Unscrew the protective cap (1).
2. Remove the storage protector (4) by unscrewing.
3. Remove the transparent cap (2) from the refilling port.
4. Refill the electrode with LiCl 1M in ethanol. Check that there are not air bubbles inside. They can be removed by shaking the electrode as clinical thermometer.
5. Slide the plastic ring (sleeve diaphragm) (6) and return it to its original position, by pressing softly, to ensure the electrical contact. If it is necessary, refill with reference electrolyte.
6. Place the NS adapter (5) on the electrode body.
7. Connect the electrode to the cable.
8. Connect the cable to the rear panel of the instrument, see Rear Panel, page 9.

### Recommendations related to the use of the electrode:

- Step 5 should be performed periodically.
- When the electrode is in use, the refilling port should stay open. During storage, close the filling port with the cap.
- Maintain the electrolyte level high (3). Refill periodically with electrolyte.



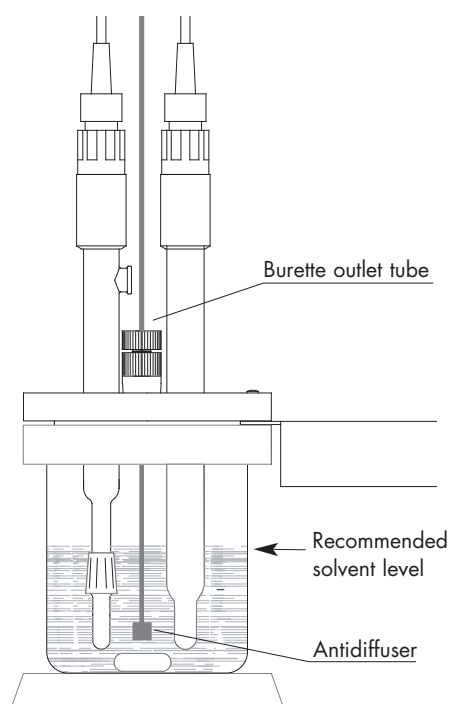
### Glass + Pt electrode

1. Unscrew the protective cap (1).
2. Remove the storage protector by unscrewing (2) (plastic tube). Remove the white piece by pulling it down. Inside there is an O-ring.
3. Place the NS adaptor (3) on the electrode body.
4. Connect the electrode to the cable.
5. Connect the cable to the rear panel of the instrument, see Rear Panel, page 9.



# INSTALLATION

## ... side view of the titration vessel

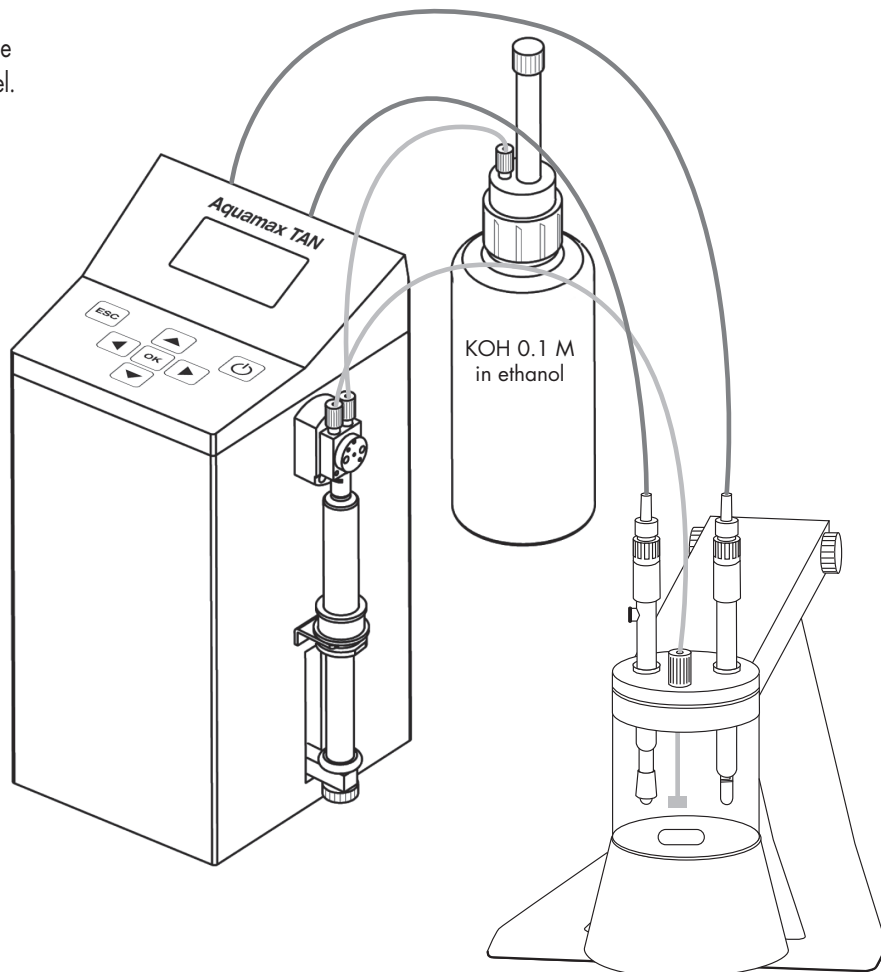


### Recommendations:

- The NS position should ensure that the sensitive part of the electrodes are immersed: glass+Pt electrode - the platinum wire, reference electrode - the sleeve diaphragm.
- The stirring bar must not knock the electrodes tips.

## GENERAL VIEW








Connect the plug-in power supply, electrode cable and magnetic stirrer to the rear panel.





# DESCRIPTION

## Keypad

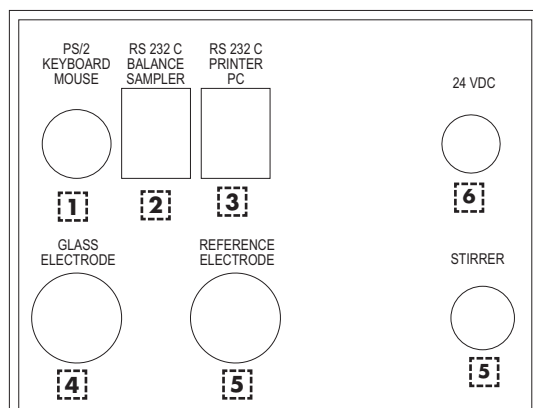
-  On/Off.
-  Move backwards in the menus.  
Interrupt a Manual activation.  
Interrupt a titration.
-  Move forwards in the menus confirming the option marked in gray (in bold in this manual).  
In the data-logger menu it displays the first register.
-  Selection between the different displayed options.  
Selection of numeric values.  
In the Data-logger it displays the next register.  
In Manual activation it empties the syringe through the outlet tube.
-  Selection between the different displayed options.  
Selection of numeric values.  
In the Data-logger it displays the previous register.  
In Manual activation it loads the syringe through the inlet tube.
-  Move forwards a digit when entering a numeric value.  
Show the next display in those menus that have more than one.
-  Move backwards a digit when entering a numeric value.  
Show the previous display in those menus that have more than one.  
In Manual activation it empties the syringe through the inlet tube.

## External keyboard: Standard PC keyboard

Its main use is the text introduction: header, user name, reagent name, and alphanumeric sample identification. It allows the introduction of numeric data too.

If the automatic sample identification is used, it is not necessary the connection of a PC keyboard to the Aquamax TAN.

## Rear panel



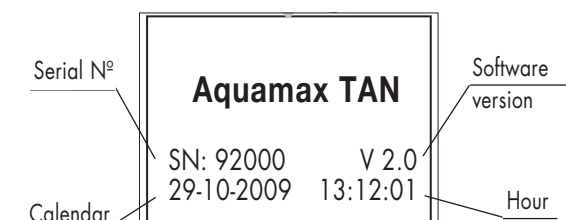
Connections for:

- 1, External PC keyboard.
- 2, Balance.
- 3, Printer or PC.
- 4, Glass+Pt Electrode.
- 5, Reference Electrode.
- 6, Magnetic stirrer.
- 7, Plug in power supply.

## Stand-by screen

If the instrument is not used for more than 5 minutes it will automatically display the "Stand-by" screen.

Press any key to go back to the previous screen.



# START UP

When switching on the instrument for the first time must be selected:

**Language.** Select the corresponding language.

**Data output.**

Select "Deactivated" if neither printer nor PC are connected.

Selecting "Printer" or "Computer", the Aquamax TAN will ask for:

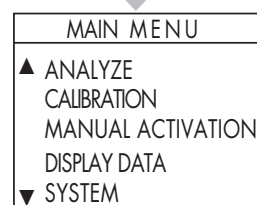
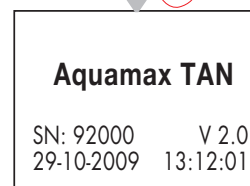
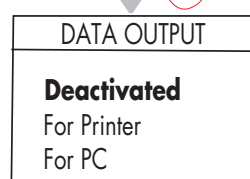
- Report header . Two lines of 20 characters for company name introduction, etc. The use of a PC keyboard is necessary.
- Sample ID. "Manual", sample identification introduction per each sample; "Automatic", consecutive sample identification assigned by the titrator.

The instrument presents the Main Menu.

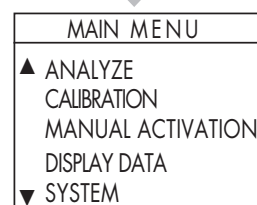
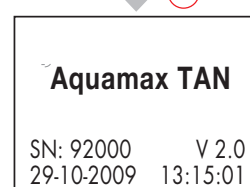
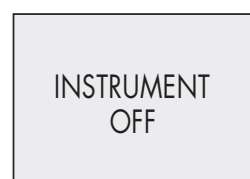
From the option SYSTEM in the main menu, the user can select: weight entrance, date and hour, etc. (see page 18).

## Switch on...

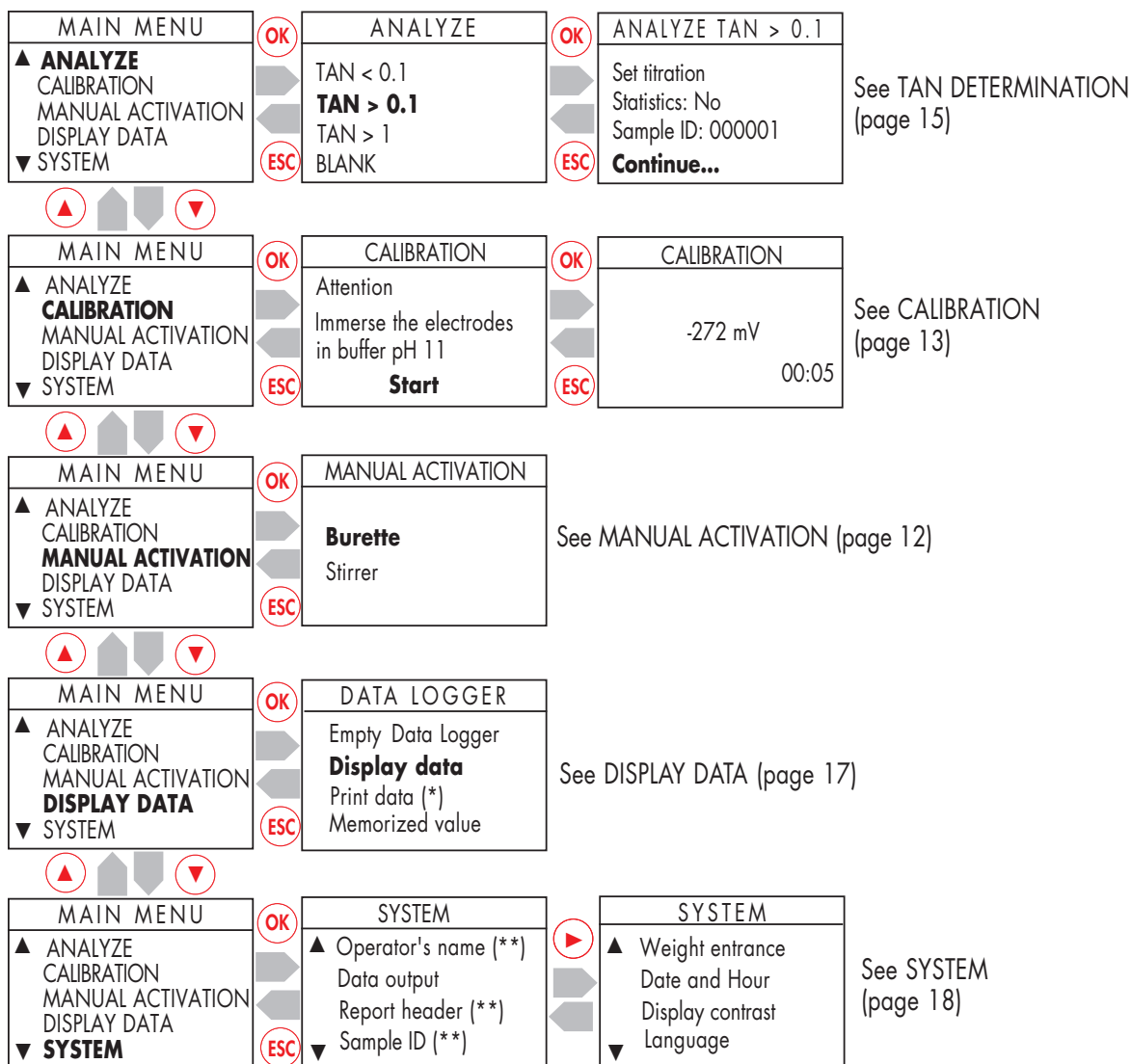
### ...for the first time



### ...successive times



## QUICK GUIDE



\* This option will appear only if a printer is connected.

\*\* These options will only appear if Data Output is activated.

# MANUAL ACTIVATION

## Syringe. Reagent loading

1. Introduce the inlet tube in the bottle containing KOH 0.1 mol/l in 2-propanol.
2. Put a vessel for waste on the titration stand below the outlet burette tube.
3. From Main Menu, select the option Manual Activation, Burette. Press successive times the keys corresponding to Fill and Empty until the liquid circuit is completely filled. It is recommended to repeat this process several times with small volumes.

The syringe movement is interrupted by pressing the key ESC or when the syringe piston reaches the position up or down.

- Fill, the syringe fills with reagent from the bottle.
- Empty, empty the syringe content into the titration vessel
- Return reagent, this options allows to return the syringe content into the bottle. It is recommended at the end of the working session or before cleaning.

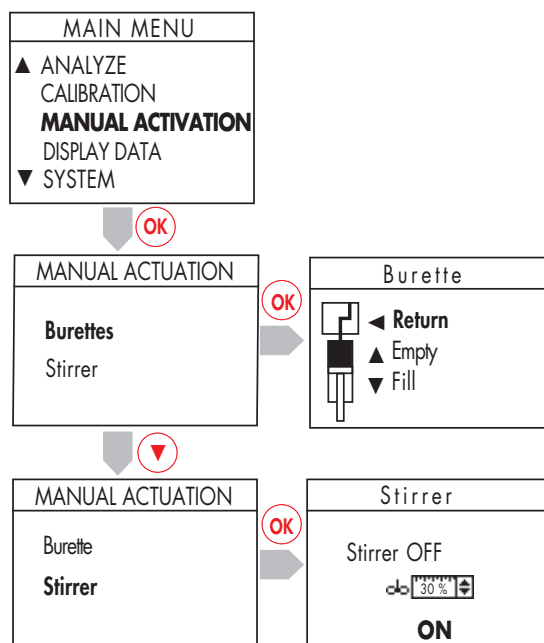


### Important:

- At the beginning of the working day, fill approx. 50% of the syringe volume and empty in waste beaker. In this way, possible air bubbles formed in the liquid circuit will be eliminated.
- It is recommended to return syringe content into the reagent bottle at the end of the working session or before cleaning.
- To clean the liquid circuit, the procedure of Reagent Loading should be carried out with ethanol.

## Stirrer

This option allows to activate the stirrer. Once activated the stirring speed can be modified with the arrow keys up and down.



# WORKING PROCEDURE

## Installation

1. Install the instrument, titration stand and electrodes in accordance with the chapters INSTALLATION, GENERAL VIEW and REAR PANEL (pages 6-9).
2. Load the titrant reagent, KOH 0.1 mol/l in 2-propanol, into the syringe, see MANUAL ACTIVATION page 12.

## TAN determination

It consists in 3 steps:

1. Calibrate the electrodes with buffer pH 11.  
See WORKING PROCEDURE: CALIBRATION, page 13.
2. Blank determination.  
See WORKING PROCEDURE: BLANK DETERMINATION, page 14.
3. TAN determination  
From the Main Menu select the option ANALYZE. See WORKING PROCEDURE: TAN DETERMINATION page 15.

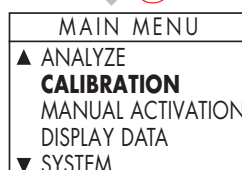
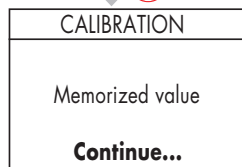
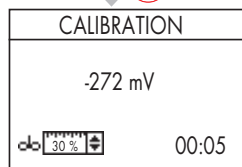
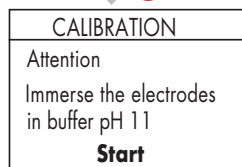
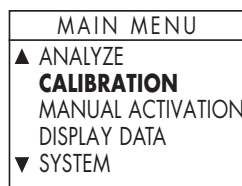
## WORKING PROCEDURE: CALIBRATION

The calibration with buffer pH 11 should be performed daily.

1. Pour approx. 45-50 ml of buffer 11 in the supplied calibration flask.
2. Place it on the titration stand and immerse both electrodes, reference and indicator. The liquid should cover the sensitive part of both electrodes. Do not immerse the outlet burette tube.
3. From the Main Menu select Calibration and follow the instructions on the instrument's display.

### Recommendations:

- Calibrate the pair of electrodes daily. The buffer solution should be in good conditions and at room temperature.
- After use close the calibration flask. This portion of buffer pH 11 can be used for performing about 3-4 calibrations. After that replace it by fresh one.
- The bottle with buffer pH 11 should be stored in cool, dry place avoiding direct sun light. After use, close the bottle with the corresponding cap.
- The stirring speed can be modified during Calibration. Nevertheless, using the supplied calibration flask and magnetic bar, the factory setting ensures stable stirring speed.



Rinse the electrodes pair with analytical grade water.  
Dry with soft tissue.  
Immerse in the calibration flask with buffer pH 11.

Automatically after 1 minute measurement.

## WORKING PROCEDURE: BLANK DETERMINATION

This process must be carried out when the instrument is used for the first time and for every new batch of titration solvent . Additionally, it is recommended to re-check periodically the blank value of the titration solvent.

1. In the titration vessel introduce 100 ml of titration solvent and the stirring bar.
2. Rinse the electrodes with 2-propanol.
3. Put the vessel containing the solvent solution on the titration stand. From the Main Menu select the option ANALYZE. Perform titration using the program "Blank".
4. Once the titration has finished, select "Accept result". In this way the Blank value is stored automatically in all TAN titration programs.
5. Once the titration has finished, rapidly remove the vessel with the titrated blank from the titration stand. Do not allow electrodes to remain immersed in titration solvent for any appreciable period of time between titration.
6. Store the electrodes as described in Electrode storage between samples, page 15.

### More features:

#### - Interrupted process

A titration can be interrupted at any moment by pressing the key ESC. On the display appears:

*Process interrupted*

*Quit*

*Continue*

Select the desired option with the arrow keys and accept with OK.

#### - Access to other parameters

*Set titration.* If this option is selected, two titration parameters can be modified:

- Advanced stirring: 20 s
- Initial addition: 0.000 ml

The above mentioned values correspond to the factory setting of the instrument.

*Delete blank.* This option allows erasing the last blank value stored in memory of the Aquamax TAN.

*Statistics.*

No: no statistics calculation in the blank determination.

Yes: statistics calculation in the blank determination. The number of samples to be performed should be programmed. See STATISTICS CALCULATION, page 20.

*Sample ID*

With Deactivated Data Output, it is always numeric and sequential assigned by Aquamax TAN.

With Activated Data Output, the sample ID can be Automatic (numeric and sequential assigned by Aquamax TAN) or Manual (allowing introduction of alphanumeric code per sample with the help of external PC keyboard), see SYSTEM page 18.

MAIN MENU
▲ <b>ANALYZE</b>
CALIBRATION
MANUAL ACTIVATION
DISPLAY DATA
▼ SYSTEM



ANALYZE
TAN < 0.1
TAN > 0.1
TAN > 1
<b>BLANK</b>

Select BLANK with the down arrow key.



ANALYZE BLANK
Set titration
Delete blank
Statistics: No
Sample ID: 000001
<b>Continue...</b>



BLANK
Sampe ID: 000001
Insert sample
<b>Start titration</b>



BLANK
0.130 ml - 255 mV
ID: 000001 04:38

If required, at this stage the stirring speed can be modified with the arrow keys.

Nevertheless the factory setting of 30% stirring speed ensures optimal homogenization.



BLANK
b = 0.146 ml
<b>Accept result</b>
Repeat result



ANALYZE
TAN < 0.1
TAN > 0.1
TAN > 1
<b>BLANK</b>

# WORKING PROCEDURE: TAN DETERMINATION

1. Prepare the sample if required as described in the norm ASTM D 664, section 10.
2. Into the titration vessel, introduce a weighed quantity of sample as recommended in the Table 1.
3. Add 100 ml of titration solvent and one stirring bar.
4. Place the titration vessel on the titration stand. From the Main Menu select the option ANALYZE. Perform the titration using the corresponding program in accordance with the expected TAN value.
5. After the analysis, the instrument presents the result in mgKOH/g.
6. Once the titration has finished, rapidly remove the vessel with the titrated sample from the titration stand. Do not allow electrodes to remain immersed in titration solvent for any appreciable period of time between titration.
7. Store the electrodes as described in Electrode storage between samples, page 15.
8. Next sample. If required selecting other titration program, press the key ESC until appearing the corresponding display.

TABLE 1

Acid Number	Mass of test portion, g	Accuracy of weighing, g
0.05 - < 1.0	20.0 ± 2.0	0.10
1.0 - < 5.0	5.0 ± 0.5	0.02
5 - < 20	1.0 ± 0.1	0.005
20 - < 100	0.25 ± 0.02	0.001
100 - < 260	0.1 ± 0.01	0.0005

## Electrodes storage:

**Between samples:** At the end of the titration, rinse the electrodes pair with titration solvent, then with 2-propanol, and finally with reagent grade water. Immerse the glass electrode in pH 4.5-5.5 water from 3 to 5 minutes to rehydrate the aqueous gel layer of the membrane. The reference electrode and burette tip can stay in air. Prior to beginning the next sample, rinse the electrodes pair with 2-propanol to remove the water.

The same solvent cleaning beaker, 2-propanol beaker and water may be used for short series of samples. They should be changed at reasonable intervals before contamination builds up.

## For middle and long period of time:

- When the reference electrode is not in use, it should be stored in the storage protector containing LiCl 1 M in ethanol.
- When the glass electrode is not in use, it should be stored in the storage protector containing pH 4,5-5,5 reagent grade water.



**Important:** At the end of the day return the reagent from the syringe to the original bottle, see MANUAL ACTIVATION.

MAIN MENU

▲ ANALYZE

CALIBRATION

MANUAL ACTIVATION

DISPLAY DATA

▼ SYSTEM

OK

ANALYZE

TAN < 0.1

**TAN > 0.1**

TAN > 1

BLANK

OK

ANALYZE TAN > 0.1

Set titration

Statistics: No

Sample ID: 000001

**Continue...**

OK

TAN > 0.1

Sample 1/1

Sampe ID: 000001

Weight: 00.0000 g

OK

TAN > 0.1

Sampe ID: 000001

Insert sample

**Start titration**

OK

TAN > 0.1

0.146 ml - 55 mV

ID: 000001 01:38

OK

BLANK

TAN 0.15 mg KOH/g

**Next sample**

OK

TAN > 0.1

Sample 1/1

Sampe ID: 000002

Weight: 00.0000 g

Select with ▲ ▼ and accept with OK

Introduce the mass of the sample

Select with ▲ ▼, modify with ▲ ▼ and accept with OK

If required, at this stage the stirring speed can be modified with the arrow keys.

Nevertheless the factory setting of 30% stirring speed ensures optimal homogenization.

If required selecting other titration program, press the key ESC until appearing the corresponding display.



## WORKING PROCEDURE: TAN DETERMINATION

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### More features:

#### - Interrupted process

The same as in Blank Determination, see page 14.

#### - Access to other parameters

*Set titration.* If this option is selected, three titration parameters can be modified:

- Advanced stirring: 20 s

Advanced stirring before starting the titration, 20 s in the programs TAN<0.1 and TAN>0.1 and 60 s in the program TAN>1. This time should allow the complete dissolving of the sample in the titration solvent before starting the titration.

- Initial addition: 0.000 ml

The instrument always performs initial addition equal to the blank value.

Higher initial addition is suitable for samples with high titrant consumption.

- KOH Conc. 0.1

Modify this value if KOH with different concentration is used.

*Statistics.*

No: no statistics calculation in the TAN determination.

Yes: statistics calculation in the TAN determination. The number of samples to be performed should be programmed. See STATISTICS CALCULATION, page 18.

*Sample ID*

The same as in Blank Determination, see page 14.

## DISPLAY DATA (DATA-LOGGER)

This option allows to manage the Data-Logger.

**Display Data:** This is a data base of the last 55 titration and blank results.

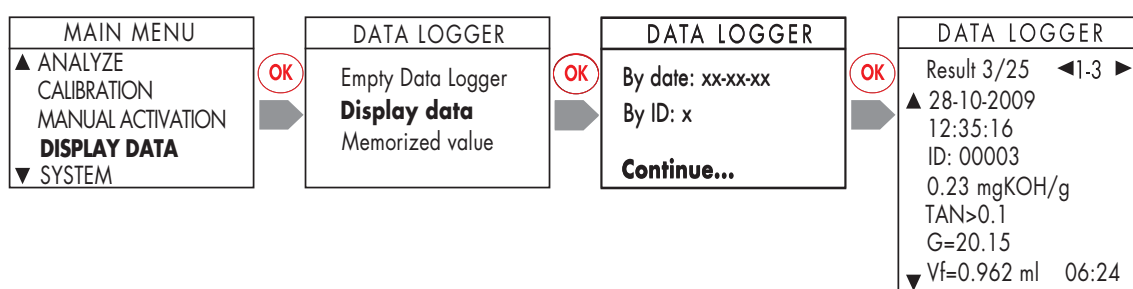
These results can be viewed on the instrument's display, printed or sent to a PC.

The Data-logger offers different queries that allow to select the results according to a pre-set search conditions. If no condition is entered, all available data will be displayed.

When the Data-logger is full, a new result will automatically replace the oldest one.

**Empty data-logger:** to erase all stored results.

**Memorized values:** This option displays the reading obtained in buffer pH 11 in the last calibration and the Blank value.

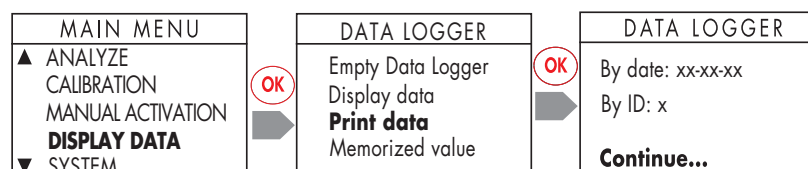


## PRINT

This option appears only when the Printer is activated in the Data Output (see SYSTEM). It allows to print the data logger.

When a Printer is connected to the Aquamax TAN, after a titration the following data will be printed:

Header, date and hour, sample ID, sample mass, titration result, final volume, titration duration, user name.



## SYSTEM

This option allows to adapt the Aquamax TAN configuration to the user needs.

**Operator's name** (17 characters): Only when the Data Output is activated. Introduction of up to 4 operator's name through an external PC keyboard. The selected name will appear on the printed report.

**Data output:** To a printer, computer or deactivated.

Select deactivated if there is no printer or PC connected.

If there is a printer, select "Printer" and the model, thermal or dotmatrix. Selecting "Computer" the options "Capture" and "TiCom" appear. Select the corresponding software.

If "Printer" or "Computer" is selected, the following options will appear in System:

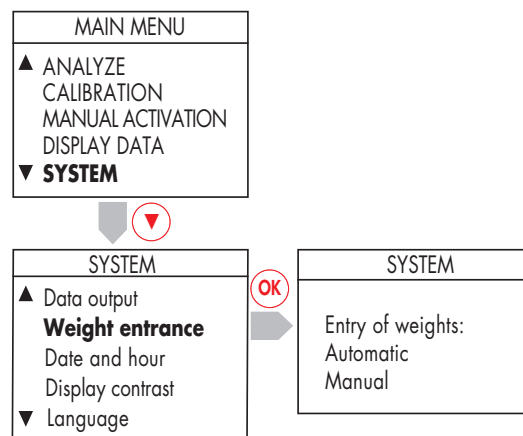
- Report header: 2 lines of 20 characters for the company name, etc. Use an external PC keyboard.
- Sample ID: Manual introduction, via external keyboard for each sample, or automatic and consecutive assignment by the instrument (9 characters).

**Weight entrance:** Automatic or manual. If automatic weight entrance is selected, the titrator requires the balance communication protocol: baud rate, word length, parity, stop bits.

**Date / Hour:** Clock and calendar.

**Display contrast:** It increases or decreases the display contrast.

**Language:** English, Spanish, Italian, French.



## WARNING AND ERROR MESSAGES

### During calibration

Attention:  $mV > -148\ mV$

Attention:  $mV < -324\ mV$

Use fresh portion of buffer pH 11 and recalibrate.

### During titration

Initial tendency

Recalibrate with fresh portion of buffer pH 11.

Check that it is not already titrated sample.

### Messages in Data-logger

Attention

Data logger empty

Continue

It appears when there are not any results stored or when the search conditions do not correspond to any stored result.

Attention

All data will be erased

Continue

It appears when the option "Erase data-logger" is selected.

### Other messages

Printing error

Attention

Repeat

No printout

Quit

The printer has been configured, but it is not connected or not switched on.

PC not connected

Attention

Repeat

No sending

Quit

The PC has been configured, but it is not connected or the connection does not work.

## RS 232 C INTERFACE

The Aquamax TAN has 2 serial ports RS 232 C that allow to communicate with a balance and with a printer or a PC.

### Connection Aquamax TAN - Balance

To receive the sample or standard weights directly from the balance, without manual transcription.

To establish the communication:

- connect the Aquamax TAN to the balance. The cable depends on the balance pinout.
- program the same communications protocol in the balance and in the Aquamax TAN. In the AquamaxTAN, it must be selected from System, Weights entrance: Automatic.

### Data output (to printer or PC)

It allows to send, through the RS 232C, the information of the results, programs, etc.

The communications protocol of the RS channel is:

Baud Rate: 9600 bps  
Word length: 8 bits  
Stop bits: 2 bits  
Parity: None

To establish the communication with the printer, it must be connected to the Aquamax TAN and select in System, Data output: to printer.

To establish the communication with a PC it is necessary to connect the PC to the Aquamax TAN with the corresponding cable and select System, Data output: to computer.

- Capture.
- TiCom.

An example of printed report

```
Quality Control
Amphill
=====
AQUAMAX TAN          SN:92901 V2.0
Monday, 02 November 2009      15:13
ANALIZE TAN > 0.1
-----
Sample ID: 000001
Sample      Volume   Result   Time
(g)         ml       mg KOH/g  mm:ss
-----
    20.0000      0.990      0.24     04:38

                                Stirring 30%

Operator: Operator 1
```

## UNITS

The result calculation is carried out in accordance with the following equation:

$$\text{Acid number, mg KOH/g} = (\text{ml-b}) \times M \times 56.1 / G$$

where:

ml = volume corresponding to the titrant reagent used in the titration (ml)

b = volume corresponding to the blank titration (ml)

M = concentration of the KOH in 2-propanol 0.1 mol/l, standard value

56.1 = molecular weight of KOH g/mol

G = sample mass, g

# STATISTICAL CALCULATIONS

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Symbol	Equation
--------	----------

n	
x	$x = \sum x_i / n$
SD (s)	$SD = \{\sum (x_i / n)^2 / n - 1\}^{1/2}$
RSD (sr)	$RSD = SD \cdot 100 / x$

where:

n: number of samples.

x: mean value.

SD (s): standard deviation.

RSD (sr): relative standard deviation.

To obtain the statistical data of an analysis it is necessary to repeat it as many times as number of samples programmed.

## Statistical calculations in a blank titration

The Aquamax TAN presents every result included in the statistics and allows to repeat those results which are considered as incorrect. With the new data the statistics is calculated again and accepting the result, the titre is stored automatically in all titration programs.

## Statistical calculations in a titration

The instrument shows the number of analysis, the mean value, the standard deviation and the relative standard deviation. The Aquamax TAN does not give the option to replace the incorrect values in titration statistics.

# SPECIFICATIONS

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## Non-volatile memory

3 TAN titration programs and 1 Blank program  
Electrodes pair calibration with buffer pH 11  
Clock/calendar  
Header text: 2 lines x 40 characters  
Name of up to 4 operators  
Up to 55 results stored in the data logger

## Display

Graphic backlit liquid crystal display,  
128 x 64 dots

## Keypad

Membrane, 7 keys. Keystrokes: > 6 million.  
Material: PET with protector treatment.

## Languages

English, Spanish, French, Italian

## Stepper motor

Resolution: 1/40000 of the syringe nominal value (minimum 0.001 ml)  
Dispensing accuracy (as relative error)  $\leq 0.2\%^*$   
Reproducibility of the dispensing  $\pm 0.1\%^*$   
\* for volumes more than 10% of the syringe volume

## Syringes

10 ml TLL SL. Borosilicate glass, PE tip on the synthetic plunger.

## Electrovalve

Materials in contact with the liquid: PTFE and KEL-F

## Reagent tubes

Material: PTFE

## Inputs and outputs

Glass + Pt electrode, BNC connector (differential)  
Reference electrode, BNC connector (differential)  
External keyboard, miniDIN connector  
RS 232C for PC or printer, telephone connector  
RS 232C for balance, telephone connector  
Connector RCA for stirrer

## Electrical safety

Meets EC, EN 61010

## EMC (Electromagnetic Compatibility)

Meets EC, EN 61326

## Permitted ambient conditions

Operating temperature, 15...40°C  
Storage temperature -10...50°C  
<80% relative humidity, non-condensing

## Power supply

External power supply 90-264 VAC, 47-63 Hz, 24 Volt DC

## Enclosure

ABS and enameled steel

## Physical parameters

Weight: 4 kg approx.  
Dimensions: 130 x 160 x 300 mm

# MAINTENANCE

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## Instrument maintenance

- At the end of the day return the reagent from the syringe to the original bottle.
- If the instrument is not in use for long time, it is recommended to clean the liquid circuit, tubes and syringe, with ethanol. See Manual Activation.
- If there are crystals of other sediments inside the syringe, take it out and clean it immediately. Any deterioration of the piston may cause leaks.
- Verify that the aspirating tube of the syringe does not touch the bottom of the titrant bottle. In this way, possible aspiration of sediments is avoided.

## Electrode maintenance

### Reference electrode:

- Daily refill the electrode with electrolyte, if required.
- Change periodically the electrolyte LiCl 1 M in ethanol of the reference electrode. Ensure that there are not air bubble in the electrolyte liquid.

### Glass electrode:

- If sample residue remains after the rinse with titration solvent, another solvent such as xylene, heptane or chloroform may be used for rinse. Afterwards, soak briefly in 2-propanol to remove the solvent, then soaking in pH 4.5-5.5 water 3 to 5 minutes to rehydrate.

Instrument supplied by:



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